

WHAT IS CLAIMED IS

1. A paper identification counter comprising:

a counter body;

a hopper which is formed to the counter body and to which papers to be identified and counted are fed;

a paper conveyance unit including a conveyance passage along which the papers from the hopper is conveyed one by one in a direction of a short width side of the papers;

a paper identification unit disposed on a way of the conveyance passage for identifying and counting the papers; and

a stacker in which the papers delivered from the conveyance passage are stacked;

said conveyance passage including a U-shaped curvilinear conveyance region on a way between said hopper and said stacker.

2. A paper identification counter according to claim 1, wherein said hopper is disposed at a top portion of the counter body and said stacker is disposed on a front surface portion of the counter body at the lower portion thereof in an installed state of the counter, said U-shaped curvilinear conveyance region is formed on a back side portion of the counter body at a lower portion thereof, and

said conveyance passage includes, in combination, a rectilinear conveyance identification region extending from said hopper to said U-shaped curvilinear conveyance region and a downstream conveyance region extending from said U-shaped curvilinear conveyance region up to said stacker.

3. A paper identification counter according to claim 2, wherein said U-shaped curvilinear conveyance region provides a paper identification/judgement region and said downstream conveyance region provides a paper reject discrimination conveyance region.

4. A paper identification counter according to claim 2, wherein said paper identification unit is disposed in said rectilinear conveyance region of the conveyance passage, said paper identification unit including at least a kind identification sensor for identifying and discriminating the kind of the papers and a true-counterfeit identification unit for judging whether said papers are true or counterfeit, said kind identification sensor and said true-counterfeit identification unit being spaced apart from each other with an interval in the longitudinal direction of said conveyance passage.

5. A paper identification counter according to claim 2, wherein said U-shaped curvilinear conveyance region

comprises a reverse feed drive roller having a diameter of two-thirds or more of the paper feed width, a curved guide plate confronting an outer periphery of said reverse feed drive roller, and a pair of driven rollers disposed on an inflow side and an outflow side of the curvilinear conveyance region.

6. A paper identification counter according to claim 2, wherein said downstream conveyance region is angled and forms the reject discrimination conveyance region for rejecting the papers out of identification and damaged papers and a reject conveyance region diverges from the downstream of said reject discrimination conveyance region.

7. A paper identification counter according to claim 2, wherein in said downstream conveyance region, a gate timing sensor is disposed at an inlet side of the reject discrimination conveyance region for detecting presence or absence of the papers being conveyed, said downstream conveyance region including a switching gate disposed at a downstream side of said timing sensor to allow a changeover operation to a reject conveyance region in response to a detection signal from said gate timing sensor.

8. A paper identification counter comprising:  
a counter body;

a hopper which is formed to the counter body and to which papers to be identified and counted are fed;

W3 <sup>The</sup> a delivery mechanism for delivering the papers fed to ~~the~~ hopper to a conveyance passage;

a paper conveyance unit for conveying the delivered papers one by one along said conveyance passage in a direction of short width side of the papers at a conveyance speed of 1,200 sheets or more per minute;

a paper identification unit disposed on a way of the conveyance passage for identifying and counting the papers; and

a stacker in which the identified and counted papers delivered through a U-shaped curved region are stacked;

said paper conveyance unit including a paper delivery drive system for delivering and conveying the papers from the hopper up to the U-shaped curved region and a paper conveyance drive system for conveying the papers from the U-shaped curved region to the stacker, said paper delivery drive system and said paper conveyance drive system being driven by driving sources, respectively.

9. A paper identification counter according to claim 8, wherein said paper conveyance drive system conveys, to a pocket, the papers lying within a reject conveyance region diverging from the U-shaped curved region at a downstream

side thereof.

10. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of the counter body;

a stacker disposed at a front portion of the counter body;

a conveyance passage formed in said counter body so as to extend from the hopper to the stacker; and

a pocket disposed above said stacker and adapted to store therein papers rejected from the conveyance passage, said pocket including a pocket bearer and a support member covering the pocket bearer from a front side thereof.

11. A paper identification counter according to claim 10, wherein said pocket includes a pocket bearer disposed at a free end of a guide arm of a reject conveyance passage opening mechanism, a forward extending pocket arm securely fastened to the counter body and a support member interposed between the free end of said pocket arm and the fore-end of said pocket bearer, said support member being supported by one of the free end of the pocket arm and the fore-end of the pocket bearer and being releasably fixed to another one thereof.

12. A paper identification counter according to claim 10, wherein said pocket is opened at both sides thereof, a front side portion of the pocket being covered with a pair of side members which are supported by one of said free end of the pocket arm and said fore-end of the pocket bearer, said pair of side members being releasably fixed to another one thereof by one-touch fastening means.

13. A paper identification counter according to claim 12, wherein said one-touch fastening means is magnet means.

14. A paper identification counter according to claim 10, wherein said support member is provided with a shock absorbing resilient member adhering an inside portion of the pocket and said support bearer is notched centrally at the front portion thereof so as to form a retrieval opening.

15. A paper identification counter according to claim 14, wherein said resilient member is a sponge.

16. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of said counter body;

a stacker disposed at a front portion of said counter body;

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a conveyance passage formed in said counter body so as to extend from the hopper to the stacker, said conveyance passage including a rectilinear conveyance passage descending from the hopper through a delivery mechanism along a back side of the counter body, a U-shaped curvilinear conveyance passage continuous with said rectilinear conveyance passage, disposed at the lower portion on the back side of the counter body, and a downstream conveyance passage extending from the curvilinear conveyance passage to the stacker; and

a back side conveyance passage opening mechanism disposed on a back side of the rectilinear conveyance passage so as to be pivotal about a pivot at a lower portion of the counter body in an installed state thereof.

17. A paper identification counter according to claim 16, wherein said back side conveyance opening mechanism includes a rear opening guide arm mechanism which is pivotal about a pivot disposed at a lower front portion of said U-shaped curvilinear conveyance passage, said opening guide arm mechanism including guide plates constituting the rectilinear conveyance passage and the U-shaped curvilinear conveyance passage.

18. A paper identification counter according to claim 16, wherein said rear opening guide arm mechanism includes

a two-foldable frame structure comprising a lower guide arm, an upper guide arm and lock means for fixing through one-touch operation a top portion of the upper guide arm to a back side upper portion of the counter body to be detachably.

19. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of said counter body;

a stacker disposed at a front portion of said counter body;

a conveyance passage formed in the counter body so as to extend from the hopper to the stacker, said conveyance passage including a rectilinear conveyance passage descending from the hopper through a delivery mechanism along a back side of the counter body, a U-shaped curvilinear conveyance passage continuous with said rectilinear conveyance passage, disposed at a lower portion on the back side of said counter body, and an angled conveyance passage extending from the curvilinear conveyance passage to the stacker; and

an angled conveyance passage opening mechanism disposed below the angled conveyance passage to be pivotal about a pivot at a lower portion of said counter body in an installed state thereof.



20. A paper identification counter according to claim 19, wherein said angled conveyance passage opening mechanism includes a front opening guide arm mechanism to be pivotal about a pivot disposed at a lower front portion of said U-shaped curvilinear conveyance passage, said opening guide arm mechanism including a guide plate constituting the angled conveyance passage.

21. A paper identification counter according to claim 19, wherein said front opening guide arm is displaced between a set position and an opening position around a pivot common to said rear opening guide arm mechanism, said front opening guide arm mechanism being always biased towards said set position.

22. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of said counter body;

a stacker disposed at a front portion of said counter body;

a conveyance passage formed in said counter body so as to extend from the hopper to the stacker, said conveyance passage including a rectilinear conveyance passage descending from the hopper through a delivery

mechanism along a back side of the counter body, a U-shaped curvilinear conveyance passage continuous with said rectilinear conveyance passage, disposed at the lower portion on the back side of said counter body, an angled conveyance passage extending from the curvilinear conveyance passage to the stacker, and a reject conveyance passage diverging from the angled conveyance passage at a top portion thereof; and

a reject conveyance passage opening mechanism disposed below the reject conveyance passage to open the reject conveyance passage.

23. A paper identification counter according to claim 22, wherein said reject conveyance passage opening mechanism includes an opening guide arm mechanism to be pivotal about a pivot disposed centrally at a lower portion of the counter body, said opening guide arm mechanism including a guide plate constituting the reject conveyance passage.

24. A paper identification counter according to claim 23, wherein said opening guide arm mechanism is releasably attached, at a free end side thereof, to said counter body by locking means, said locking means being released through an operative force transmission mechanism to thereby open the opening guide arm mechanism by its own weight.

25. A paper identification counter according to claim 23, wherein said opening guide arm mechanism includes a guide arm which is pivotable about a pivot, said guide arm being formed at a free end thereof with a pocket bearer for a pocket.

26. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of said counter body;

a stacker disposed at a front portion of said counter body;

a conveyance passage formed in said counter body so as to extend from the hopper to the stacker, said conveyance passage including a rectilinear conveyance passage descending from the hopper through a delivery mechanism along a back side of said counter body, a U-shaped curvilinear conveyance passage continuous with said rectilinear conveyance passage, disposed at the lower portion on the back side of the counter body, and a downstream conveyance passage extending from the curvilinear conveyance passage up to said stacker; and

a paper identification unit disposed along said rectilinear conveyance passage and adapted to perform a paper identification/counting and true-counterfeit

discrimination, said paper identification unit having a line sensor arranged so as to traverse said conveyance passage.

27. A paper identification counter according to claim 26, wherein said line sensor is a light transmission sensor comprising a light emission side sensor member and a light reception side sensor member which are splittable in assembly, said line sensor iterating a line scanning to scan, for identification, the overall surfaces of papers conveyed along the conveyance passage.

28. A paper identification counter according to claim 26, wherein said line sensor has a sensor body including a light emission side sensor member and a light reception side sensor member which are splittable in assembly, said line sensor being formed with a guide passage for guiding papers at a portion defined between said two sensor members.

29. A paper identification counter according to claim 28, wherein said guide passage includes a tapered guide path having a dimension gradually reduced towards an inlet side thereof and a parallel slit-like guide path that follows the tapered guide path, said slit-like guide path having a gap of several millimeters therein.

30. A paper identification counter according to claim 28, wherein said light emission side sensor member of said line sensor includes a plurality of light emission elements arrayed in line, said light reception side sensor member of the line sensor including a plurality of light reception elements arrayed in a line so as to correspondingly confront the light emission elements.

31. A paper identification counter according to claim 28, wherein said light emission side sensor member of said line sensor includes a plurality of light emission elements arrayed in a line at a predetermined pitch and a lens member for collimating diffused rays from said plurality of light emission elements, said light reception side sensor member of the line sensor including a plurality of light reception elements correspondingly confronting the plurality of light emission elements and a lens member for focusing parallel rays from the plurality of light emission elements to the plurality of light reception elements.

32. A paper identification counter according to claim 28, wherein said light emission side sensor member of said line sensor includes several tens of light emission elements arrayed at 5 mm pitch and includes several tens of light reception elements correspondingly confronting the

light emission elements.

33. A paper identification counter according to claim 26, wherein said paper identification unit comprises a couple of light reflection front-reverse identification sensors disposed on both sides of said conveyance passage for discriminating front or reverse of said papers, said couple of identification sensors being spaced apart from each other in a width direction of said conveyance passage.

34. A paper identification counter according to claim 26, wherein said paper identification unit comprises a true-counterfeit identification sensor for judging the true or counterfeit of papers, said true-counterfeit identification sensor being composed of at least one of a magnet sensor and an UV sensor.

35. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of said counter body;

a stacker disposed at a front portion of said counter body;

a conveyance passage formed in said counter body so as to extend from the hopper to the stacker;

a feed mechanism for feeding papers stacked on a

bottom of said hopper to said conveyance passage; and

a delivery mechanism for delivering the papers from said feed mechanism to said conveyance passage;

said feed mechanism and said delivery mechanism having a feed roller and a delivery roller, respectively, which are rotationally driven in synchronism with each other, said feed roller and said delivery roller each being formed, at a portion in a circumferential direction thereof, a friction member for providing a paper feed frictional force, said feed roller and said delivery roller being each provided with a balancer weight at a location diametrically opposing to said friction members.

36. A paper identification counter according to claim 35, wherein said delivery mechanism includes a stop member coming into press contact with said delivery roller, said stop member preventing papers from being fed in an overlapped manner.

37. A paper identification counter comprising:

a counter body;

a hopper disposed at a top portion of said counter body;

a stacker disposed at a front portion of said counter body;

a conveyance passage formed in said counter body so

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as to extend from the hopper to the stacker, said conveyance passage comprising a rectilinear conveyance passage descending from the hopper through a delivery mechanism along a back side of the counter body, said rectilinear conveyance passage including a paper identification unit provided with a line sensor, said line sensor being a light transmission detector including a plurality of light emission elements which are arrayed in a width direction of the conveyance passage and including a plurality of light reception elements which confront the plurality of light emission elements in a one-to-one corresponding manner;

a scanning processing circuit arranged so as to serially scan, in a line, a train of said light reception elements of said line sensor; and

an arithmetic CPU arranged so as to process serial scanning data from said scanning processing circuits.

38. A paper identification counter according to claim 36, wherein said scanning processing circuit comprises:

a sensor scanning circuit for serially scanning the train of the light reception elements of the line sensor in response to a drive signal from said control CPU and to an encoder drive signal from an encoder detecting a rotational speed of a delivery roller of a delivery mechanism;



a signal processing circuit for processing test data signals as a result of serial scanning of the train of the light reception elements; and

an AD converter for converting an analog signal to a digital signal so as to input a test data digital signal from said AD converter to said arithmetic CPU.

39. A paper identification counter according to claim 37, wherein said control CPU and said arithmetic CPU are mounted on a circuit board accommodated in a side space inside the counter body, said control CPU performing a control of a delivery drive motor, a conveyance drive motor, a brake for stopping said delivery drive motor and various sensors, said arithmetic CPU being an arithmetic only processor processing a scanning data from said line sensor.

40. A paper identification counter according to claim 38, wherein said control CPU issues start/stop and brake signals for a delivery drive motor and a conveyance drive motor to a motor driver, said control CPU providing a rotation control of said drive motors by way of an autonomous rotation control circuit which receives a reference clock signal from said control CPU and a signal from an encoder detecting the rotational speed of said delivery drive motor and said conveyance drive motor.

41. A paper identification counter according to claim 37, wherein said control CPU includes a bus emulator circuit intervening between said control CPU and a display panel such as an LCD, said bus emulator circuit achieving matching with an interface of said display panel to partially share a processing to be effected by said control CPU.

42. A method of identifying and counting papers comprising the steps of:

delivering papers stacked in a hopper to a conveyance passage at a delivery speed of 200 sheets per minute or more by means of a delivery mechanism;

guiding said delivered papers to a rectilinear conveyance passage descending along a back side of a counter body;

making paper identification, counting and true-counterfeit judgment by a paper identification unit in a process of passing the rectilinear conveyance passage;

leading the papers identified and counted by the paper identification unit, through a U-shaped curvilinear conveyance passage at a lower portion on a back side of the counter body, to a downstream conveyance passage; and

delivering the papers through the downstream conveyance passage to a stacker for stacking the papers.

43. A method of identifying and counting papers according to claim 42, wherein said downstream conveyance passage is an angled conveyance passage having a top from which a reject conveyance passage diverges, and out-of-identification/counting papers, among said papers identified and counted by said paper identification unit, are led to said reject conveyance passage and then to a pocket for stacking the out-of-identification/counting papers.

44. A method of identifying and counting papers according to claim 42, wherein said paper identifying unit includes a light transmission type line sensor, a train of light reception elements arrayed in the width direction of said conveyance passage are serially scanned by the line sensor to effect a line scanning to the papers in a longitudinal direction thereof, and the line scanning to scan the overall surfaces of the papers is iterated for identification and counting thereof.